

**Remarks/Arguments**

Applicant thanks the Examiner for careful consideration of the application.

Applicant amends claims 3-6, 10-11, 14, 31, and 49-56.

No claims have been allowed by the Examiner.

**I. Rejections under 35 U.S.C. §112:**

On page 2 of the Office Communication Examiner has rejected claims 1-56 under 35 U.S.C. §112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 1, 46, 49, 50, and 54 Examiners states that "it is unclear whether 'bcc phase tantalum' means that the layer is pure Ta. If not, it is unclear what criteria are used to ascertain whether an alloy or compound meets the phase requirement. Applicant respectfully traverses Examiner's rejection. Applicant believes Examiner has failed to establish a prima facie case of indefiniteness. Applicant believes that any rejection under §112 second paragraph must show the following three elements in order to establish a prima facie case of indefiniteness: 1) the claims, when read in view of the specification are unclear; 2) the claim language is unclear to one of ordinary skill in the art; and 3) the interpreted claim language is not reasonably defined. Applicant notes that claim 1 claims "creating a tantalum layer disposed on a first layer region of a first layer and on a second layer region of a second layer, wherein said tantalum layer is a substantially bcc-phase tantalum region on said first layer region and said tantalum layer is a non-bcc-phase tantalum region on said second layer region." Applicant asserts that claim 1 when read in view of the specification is not unclear but rather is clear on its face as "bcc phase" is a commonly accepted term in the art of thin films and solid state physics and thus bcc phase tantalum is an accepted term. Applicant notes that Examiner may not be familiar with the term bcc which is a commonly used

shorthand for body-centered-cubic as Applicant states in paragraph 2 of the specification. Applicant notes that there are numerous references to and descriptions of both the tantalum layer and "bcc phase tantalum" in the specification. Applicant refers Examiner to paragraphs 2, 8, 10, 13-15, 17-18, 20-22 and 28 as just a few paragraphs that refer to and describe both the tantalum layer and the bcc phase tantalum. Applicant believes that the meaning of every term used in claims 1, 46, 49, 50, and 54 is apparent from the descriptive portion of the specification with clear disclosure as to its import." *See*, MPEP §608.01(o). *See also* 37 C.F.R. §1.75. Applicant further believes that claims 1, 46, 49, 50, and 54, when read in light of the specification, reasonably apprise those skilled in the art both of the utilization and scope of the invention, as well as being as precise as the subject matter permits. *See e.g. North Am, Vaccine, inc. v. American Cyanamid Co.*, 7 F.3d 1571, 28 USPQ 2d 1333, 1339 (Fed Cir. 1993).

Applicant respectfully asserts that Examiner may be improperly isolating or focusing on the term "bcc phase tantalum" and requiring further definition when Applicant believes that "bcc phase tantalum" when read taking all of the claimed limitations into consideration and when read in view of the specification is not unclear. Applicant noted in the background section that it is well known that tantalum films may be produced in two different crystallographic phases, body-centered-cubic (bcc), commonly referred to as alpha tantalum ( $\alpha$ -phase), and tetragonal, commonly referred to as beta tantalum ( $\beta$ -phase). Applicant believes that Examiner, in requesting further definition such as whether the layer is pure Ta and if not what criteria are used to ascertain whether an alloy or compound meets the phase requirement, may be improperly associating claim breadth with claim indefiniteness. Applicant believes that the breadth of a claim is not to be equated with indefiniteness. Applicant respectfully asserts that "bcc phase tantalum" is clear on its face in regards to crystallographic phases of thin films. In addition, this is further highlighted because bcc phase tantalum has obtained the status, within the prior art of tantalum sheets, films and layers, of routinely being referred to as alpha tantalum. Applicant believes that Examiner in requesting additional defining criteria adds confusion to a term that is clear on its face. Applicants note that tantalum can be formed in an  $\alpha$ -phase or in a  $\beta$ -phase at various levels of purity, i.e. purity by itself is not a determining criteria. Thus, Examiner in requesting

purity criteria or some other criteria beyond that which is generally utilized to determine crystallographic structure is improperly requiring Applicant to restrict or limit Applicant's claimed invention beyond what is required by 35 U.S.C. §112. Applicant respectfully requests Examiner provide some reasoned technical argument how the crystallographic criteria generally utilized to determine whether or not a tantalum layer is bcc phase tantalum is not sufficiently clear to warrant rejecting claims 1, 46, 49, 50, and 54 as being indefinite.

In addition, as Applicant noted above the claim language must be unclear to one of ordinary skill in the art. Applicant notes that all three of Examiner's cited prior art references use the terms  $\alpha$ -tantalum and  $\beta$ -tantalum as well as BCC  $\alpha$ -tantalum. One of the cited references Colgan (US Patent No. 5,221,449), in the background section, includes an extensive review of the prior art and the common use of  $\alpha$ -tantalum referring bcc phase tantalum and also summarizes the wide variety of conditions and variables affecting the formation of this crystallographic phase of tantalum thin films. Applicant believes that Examiner must establish that one of ordinary skill in the pertinent art, when reading the claim in light of the supporting specification, would not have been able to ascertain with a reasonable degree of precision and particularity the specific area set out and circumscribed by the claim. *See Schenk v. Norton Corp.*, 713 F.2d 782, 786-787, 218 USPQ 698, 701-702 (Fed Cir. 1983). Applicant asserts that in view of the prior art use of the term bcc phase or  $\alpha$ -tantalum for tantalum thin films requires Examiner to provide a reasoned argument how "bcc phase tantalum" would be unclear to one of ordinary skill in the art. Applicant asserts that Applicant's present invention may utilize any of the conditions, materials, techniques, processes etc. described in the prior art to generate the bcc phase tantalum layer claimed without rendering Applicant's invention anticipated or obvious.

Accordingly Applicant believes that Examiner's rejection of claims 1, 46, 49, 50, and 54 under 35 U.S.C. §112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been overcome. Therefore, Applicant respectfully requests Examiner

withdraw the rejection of claims 1, 46, 49, 50, and 54 under 35 U.S.C. §112 second paragraph.

In regards to amended dependent claim 4 Examiner states that "it is unclear what is being claimed by the 'further' limitation. The claim explains that there should be an "essentially contiguous tantalum film." Examiner states that it is "unclear what is the distinction, if any, between a layer and a film. Since the bcc and non-bcc regions are part of the same layer, it is unclear what 'contiguous' means in this context." Amended dependent claim 4 discloses "wherein creating said tantalum layer further comprises creating said tantalum layer wherein said substantially bcc-phase tantalum region and said non-bcc-phase tantalum region are contiguous and form a continuous tantalum film." Applicant believes that amended independent claim 4 is not indefinite. However, Applicant respectfully traverses Examiner's rejection. Applicant believes Examiner has failed to establish a prima facie case of indefiniteness. As noted above Applicant believes that any rejection under §112 second paragraph must show the claim, when read in view of the specification is unclear to one of ordinary skill in the art. Examiner has provided just a simple declaration that the meaning of the words is unclear and has provided no reasoned argument as to how such commonly used words as "layer", "film," and "contiguous" would be unclear to one of ordinary skill in the art of tantalum thin films when read in view of the specification and the prior art. Applicant requests Examiner provide a reasoned argument as to how the words Examiner asserts are unclear, are not clear in view of the specification for one of ordinary skill in the art. Accordingly Applicant believes that Examiner's rejection of claim 4 under 35 U.S.C. §112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been overcome. Therefore, Applicant respectfully requests Examiner withdraw the rejection of claim 4 under 35 U.S.C. §112 second paragraph.

In regards to amended dependent claim 6 Examiner states "it is unclear whether this additional step means that the first layer region is to be bcc tantalum or whether this additional step refers to the relationship of the bcc phase of the tantalum layer and the substrate." Amended dependent claim 6 discloses "wherein forming said first layer

region further comprises forming a bcc-phase-tantalum forming region disposed over or on said second layer." Applicant believes that amended independent claim 6 is not indefinite. However, Applicant respectfully traverses Examiner's rejection. Applicant believes Examiner has failed to establish a prima facie case of indefiniteness. As noted above the breadth of a claim is not to be equated with indefiniteness. Applicant believes that "forming a bcc-phase-tantalum forming region" is clear on its face and even if not clear on its face it is clear when read in view of the specification. Applicant asserts that "forming a bcc-phase-tantalum forming region disposed over or on said second layer," is clear and unambiguous. Accordingly Applicant believes that Examiner's rejection of amended claim 6 under 35 U.S.C. §112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been overcome. Therefore, Applicant respectfully requests Examiner withdraw the rejection of claim 6 under 35 U.S.C. §112 second paragraph.

In regards to dependent claims 11 and 48 Examiner states "it is unclear what is the relationship between these materials and a bcc Ta layer." Amended dependent claim 11 discloses "wherein creating said bcc-phase-tantalum forming first layer further comprises creating said bcc-phase-tantalum forming first layer utilizing a material selected from the group consisting of niobium, aluminum, titanium, tantalum nitride, aluminum nitride, niobium nitride, titanium nitride, and mixtures thereof." Dependent claim 48 discloses the same list of materials while referring to a "bcc-phase-tantalum forming substrate." Applicant believes that amended independent claim 11 and original dependent claim 48 are not indefinite. However, Applicant respectfully traverses Examiner's rejection. Applicant believes Examiner has failed to establish a prima facie case of indefiniteness. Applicant believes that Examiner misinterprets "bcc-phase-tantalum forming first layer" and "bcc-phase-tantalum forming substrate" as being a bcc Ta layer. Applicant believes that claims 11 and 48 are clear and unambiguous and even if not clear the limitations when read in view of the specification are clear to one of ordinary skill in the art. Accordingly Applicant believes that Examiner's rejection of claims 11 and 48 under 35 U.S.C. §112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been overcome. Therefore, Applicant respectfully requests

Examiner withdraw the rejection of claims 11 and 48 under 35 U.S.C. §112 second paragraph.

In regards to dependent claim 14, amended dependent claim 14 discloses "wherein creating said bcc-phase-tantalum forming first layer further comprises creating a monolayer bcc-phase-tantalum forming first layer as said bcc-phase-tantalum forming first layer." Applicant believes that amended dependent claim 14 is clear on its face by adding the words "as said bcc-phase-tantalum forming first layer." Accordingly Applicant believes that Examiner's rejection of claim 14 under 35 U.S.C. §112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been overcome. Therefore, Applicant respectfully requests Examiner withdraw the rejection of claim 14 under 35 U.S.C. §112 second paragraph.

On page 3 of the Office Communication Examiner states in item VI that "all of the claims where the phrase "further comprises" or the like is used, it is unclear whether the applicant means that an additional limitation is being specified or whether applicant is further defining already specified limitations." Applicant respectfully traverses Examiner's rejection of all claims having the phrase "further comprises" as being unclear. Applicant believes that Examiner has misconstrued the term "further comprises" from the transitional phrase "further comprising" or "wherein." Applicant notes that in a dependent claim when an additional limitation is being added the use of the phrase "further comprising" is an open-ended transition found just after the dependency of the claim to signify that an additional or new element to those previously recited is being claimed. The phrase "wherein" is used to modify or qualify a previously introduced element. Applicant traverses Examiner's statement that Applicant has failed to use the proper transitional phrase in the dependent claims. Applicant believes that all claims have the proper transitional phrase. Applicant also believes that Examiner may also be confusing method claims from apparatus claims where in method claims, although there is no per se objection to including structural limitations in the step elements of the method claim, when structural limitations are added in dependent method claims, these limitations are preferably phrased as method steps. *See* Robert C.

Faber, *Landis on Mechanics of Patent Claim Drafting*, §4.6, page 4-13 (5th Ed. 2004); also see Jeffrey G. Sheldon, *How to Write a Patent Application*, Chap 6 Preparing Claims (Practising Law Institute, 1997). Accordingly Applicant believes that Examiner's rejection of all claims containing the phrase "further comprises" under 35 U.S.C. §112 second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been overcome. Therefore, Applicant respectfully requests Examiner withdraw this rejection.

In regards, to dependent claim 52, amended independent claim 50 discloses "a bcc-phase-tantalum forming seed region disposed between said substrate and said tantalum layer, said bcc-phase-tantalum forming seed region in contact with said tantalum layer . . . ." Applicant has also amended dependent claim 52 to include " a first dielectric layer disposed over said resistive layer, said bcc-phase-tantalum forming seed region disposed on a portion of said first dielectric layer . . . ." Applicant believes that these amendments to claims 50 and 52 now have proper antecedent basis for all elements. Accordingly Applicant believes that Examiner's rejection of claim 52 under 35 U.S.C. §112 second paragraph, as being indefinite for failing to provide proper antecedent basis for each claimed element has been overcome. Therefore, Applicant respectfully requests Examiner withdraw the rejection of claim 52 under 35 U.S.C. §112 second paragraph.

In regards to amended independent claim 54 and amended dependent claims 55 and 56, amended independent claim 54 discloses "a substrate; and means for generating temperature gradients laterally within a tantalum layer disposed over said substrate. Applicant believes that "means for generating temperature gradients laterally within a tantalum layer" is a proper means plus function limitation. In addition, Applicant believes that "means for heating a fluid" in claim 55 and "means for electrically isolating said means for heating" in claim 56 are also proper means plus function limitations. Applicant also respectfully traverses Examiner's statement that claims 55 and 56 are laminate article claims. Accordingly Applicant believes that Examiner's rejection of claims 54-56 under 35 U.S.C. §112 second paragraph, as being indefinite for failing to provide proper antecedent basis for each claimed element has been

overcome. Therefore, Applicant respectfully requests Examiner withdraw the rejection of claims 54-56 under 35 U.S.C. §112 second paragraph.

## II. Rejections under 35 U.S.C. §102(e):

Examiner, on page 4 of the Office Communication has rejected claim 49 under 35 U.S.C. §102(b) as being anticipated by Colgan et al. (U.S. Patent No. 5,221,449, "Colgan"). This rejection is respectfully traversed with regard to claim 49 because all of the elements of the claimed invention are not present in the cited reference.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *MPEP 2131*. The identical invention must be shown in as complete detail as is contained in the . . . claim. *MPEP 2131* citing *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226 (*Fed. Cir. 1990*).

Amended independent claim 49 discloses "*a tantalum layer having therein a substantially bcc-phase tantalum region contiguous to a non-bcc-phase tantalum region, wherein said substantially bcc-phase tantalum region and said non-bcc-phase tantalum region each have a compressive residual stress*" *Emphasiss added*.

In contrast, Colgan discloses "thin sputtered films are beta Ta. A process has been developed in a batch tool. To deposit thin films of alpha-Ta, a Ta(N) seed layer is used This process consists of depositing a seed layer of nitrided Ta . . . and then sputtering Ta in argon with no nitrogen" to form the alpha-Ta layer Col. 6, lines 27-33. In addition, Colgan further discloses, this "invention discloses a simple process to reproducibly deposit alpha (bcc) tantalum on a substrate. The process comprises first depositing a thin seed layer or underlayer of tantalum doped with a small amount of nitrogen . . . followed by depositing the required tantalum film thickness in the conventional way." Col. 5, lines 12-18. Thus, Colgan discloses a method of forming a blanket alpha-Ta film by using a Ta(N) seed layer.



Colgan does not disclose "a tantalum layer having therein a substantially bcc-phase tantalum *region* contiguous to a non-bcc-phase tantalum region, wherein said substantially bcc-phase tantalum region and said non-bcc-phase tantalum region each have a compressive residual stress." Applicant believes that Examiner may be confusing a tantalum layer having a substantially bcc-phase tantalum region and a non-bcc-phase tantalum region where the two regions are contiguous with two separate Ta layers one Ta layer being bcc-phase and a second Ta layer being non-bcc. Applicant agrees with Examiner on the bottom of page 4 of the Office Communication that Colgan teaches a bcc Ta layer and a non-bcc Ta layer that are contiguous. In addition, Applicant traverses Examiner's statement that in view of the formation by sputtering it would be expected that the claimed stress requirements are satisfied. Because Colgan does not disclose "a tantalum layer having therein a substantially bcc-phase tantalum region contiguous to a non-bcc-phase tantalum region, wherein said substantially bcc-phase tantalum region and said non-bcc-phase tantalum region each have a compressive residual stress," as recited in amended independent claim 49, Colgan does not anticipate or render obvious amended independent claim 49, since the above elements of the instant claimed invention are arranged in a manner distinct from that disclosed in Colgan.

Since a proper anticipation rejection requires that there be present in a single prior art reference a disclosure of all of the elements of the claimed invention arranged as in the claims, Applicant believes that Colgan does not anticipate claim 49. *See* MPEP 2131. Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claim 49 based on Colgan under 35 U.S.C. § 102(b).

Examiner, at the bottom of page 4 of the Office Communication has rejected claim 49 under 35 U.S.C. §102(b) as being anticipated by Chen et al. (U.S. Patent Pub. No. 2003/0124262, "Chen"). This rejection is respectfully traversed with regard to claim 49 because all of the elements of the claimed invention are not present in the cited reference.

In contrast to claim 49 as recited above, Chen discloses "an alpha phase tantalum ( $\alpha$ -Ta) layer having a thickness of about 20 Å or less, such as about 10 Å, may be deposited over at least a portion of the previously deposited binary (TaN) or ternary (TiSiN) layers. Applicant agrees with Examiner, as with Colgan, Chen discloses a bcc Ta layer and a non-bcc Ta layer that are contiguous. In addition, Applicant traverses Examiner's statement that in view of the formation by PVD, it would be expected that the claimed stress requirements are satisfied. Because Chen does not disclose "a tantalum layer having therein a substantially bcc-phase tantalum region contiguous to a non-bcc-phase tantalum region, wherein said substantially bcc-phase tantalum region and said non-bcc-phase tantalum region each have a compressive residual stress," as recited in amended independent claim 49, Chen does not anticipate or render obvious amended independent claim 49, since the above elements of the instant claimed invention are arranged in a manner distinct from that disclosed in Chen. Accordingly, Applicant believes that Chen does not anticipate the present invention. *See* MPEP 2131. Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claim 49 based on Chen under 35 U.S.C. § 102(b).

Examiner, at the top of page 5 of the Office Communication has rejected claims 49 and 50 under 35 U.S.C. §102(b) as being anticipated by Koyama et al. (U.S. Patent No. 4,364,099, "Koyama"). This rejection is respectfully traversed with regard to claims 49 and 50 because all of the elements of the claimed invention are not present in the cited reference.

In contrast to claim 49 as recited above Koyama discloses, as Examiner states at the top of page 5 of the Office Communication, a bcc Ta layer and a non-bcc Ta layer that are contiguous. Amended independent claim 50 discloses

"a tantalum layer disposed over said substrate; and a bcc-phase-tantalum forming seed region disposed between said substrate and said tantalum layer, said bcc-phase-tantalum forming seed region in contact with said tantalum layer, wherein said tantalum layer forms a substantially bcc-phase tantalum region where said tantalum layer is in contact with said bcc-phase-tantalum forming seed region, and wherein said tantalum layer forms a non-

bcc-phase tantalum region where said tantalum layer is not in contact with said bcc-phase tantalum forming seed region."

As noted above Koyama discloses two Ta layers but does not disclose a Ta layer having both a bcc-phase region and a non-bcc phase region. In addition, Applicant traverses Examiner's statement that in view of the formation by sputtering it would be expected that the claimed stress requirements are satisfied. Because Koyama does not disclose the claim limitations as recited in independent claim 49, and 50 Koyama does not anticipate or render obvious independent claims 49 or 50, since the above elements of the instant claimed invention are arranged in a manner distinct from that disclosed in Koyama. Accordingly, Applicant believes that Koyama does not anticipate independent claims 49 and 50. *See* MPEP 2131. Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claims 49 and 50 based on Koyama under 35 U.S.C. § 102(b)

### **III. Conclusion:**

While Applicant agrees with Examiner's conclusions regarding the fact that none of the reviewed prior art of record teaches or suggests the subject matter of claims 1-48 and 51-53 Applicant does not necessarily agree with or acquiesce in the Examiner's reasoning. In particular, Applicant submits that the prior art fails to teach, anticipate, or render obvious the invention as claimed, in the above identified claims, independent of how the invention is paraphrased.

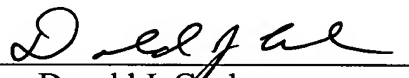
Therefore, in view of the foregoing Amendment and Remarks, Applicant believes the present application to be in a condition suitable for allowance. Examiner is respectfully urged to withdraw the rejections, reconsider the present Application in light of the foregoing Amendment, and pass the amended Application to allowance.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is respectfully requested to call Applicants' representative at (541) 715-1694 to discuss the steps necessary for placing the application in condition for allowance.

Favorable action by the Examiner is solicited.

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